**EAS 41700/B9025 Satellite Meteorology**

**Spring 2017**

**Instructor**: Prof. Johnny Luo, Office: MR-927, 212-650-8936, [zluo@ccny.cuny.edu](mailto:zluo@ccny.cuny.edu);

**Time**: M/W 9:30 -10:45; **Location**: MR044;

**Grader:** TBA

**Office hours**: after class or by appointment (212-650-8936)

**Class website**: <http://www.sci.ccny.cuny.edu/~luo/EAS417>

**Description**: Satellites have become an increasingly important tool for studying and monitoring the Earth’s weather and climate. This class will introduce to the students a vibrant, new branch of the Atmospheric Science – Satellite Meteorology. The following subjects will be covered: 1) orbits of meteorological satellites, 2) instruments they carry, 3) fundamentals of atmospheric radiation and remote sensing, 4) meteorological parameters that can be retrieved from satellites, and 5) some selected applications. In addition, we will learn how to use a programming language (e.g., Matlab) to display and analyze satellite data.

**Prerequisites**: Math 201 and 202 (203 is desirable but not required), General Physics 203-204 or 207-208 (the latter two are desired but the former two should suffice). Programming experience (e.g., Matlab) is highly desirable.

**Textbooks**:

(Main text) *Satellite Meteorology: An Introduction*, by Stanley Q. Kidder and Thomas H. Vonder Haar, Academic Press, 466pp

(Supplementary text) *Remote Sensing of the Lower Atmosphere: An Introduction* by G. L. Stephens, Oxford Press, 523pp

***Grading:***

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|  | Undergrad | Graduate |
| Homework | 10% | 10% |
| In-class tests | 20% | 20% |
| Final Project | 40% (up to 2 ppl per group) | 50% (one student per group) |
| Final Exam | 30% | 20% |

**Course Objectives:**

1. Describe physical laws governing satellite orbits and list various orbits of the meteorological satellites;

2. Understand fundamentals of atmospheric radiation and remote sensing;

3. Be able to interpret meteorological satellite images including visible, IR and microwave images;

4. Understand satellite retrievals of meteorological parameters especially cloud parameters.

5. Get familiarized with accessing and analyzing NASA satellite data

**Course Outline:**

(Note: weekly plan may be subject to small changes)

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| Dates | EAS417 Topics | Note |
| Jan 30 | Introduction |  |
| Feb 1 | Satellite orbits & navigation I |  |
| Feb 6 | Satellite orbits & navigation II | Hw #1 part 1 posted |
| Feb 8 | Satellite orbits & navigation III |  |
| Feb 13 | No class (Lincoln’s Birthday) |  |
| Feb 15 | Satellite orbits & navigation IV | Hw #1 part 2 posted |
| Feb 20 | No class (President’s Day) |  |
| Feb 22 | In-class Lab 1: calculate and plot satellite orbits | Hw #1 part 3 posted |
| Feb 27 | Atmospheric radiation I: BB radiation, & gaseous absorption |  |
| Mar 1 | **Test 1** | Test 1 (15 pts) |
| Mar 6 | Atmospheric radiation II: Gaseous absorption & dielectric materials |  |
| Mar 8 | Atmospheric radiation III: Particle scattering |  |
| Mar 13 | Atmospheric RS I: absorption-scattering | Hw #2 part 1 posted |
| Mar 15 | In-class Lab 2: access and analyze satellite data I (passive sensing: MODIS) | Hw #2 part 2 posted |
| Mar 20 | Atmospheric RS II: absorption-emission |  |
| Mar 22 | Atmospheric RS III: radar & lidar |  |
| Mar 27 | In-class Lab 3: access and analyze satellites data, II (active sensing: CloudSat) |  |
| Mar 29 | **Test 2** | Test 2 (15 pts) |
| Apr 3 | Meteorological satellites & instrumentation I |  |
| Apr 5 | Meteorological satellites & instrumentation II |  |
| Apr 10 | No class (Spring Break) |  |
| Apr 12 | No class (Spring Break) |  |
| Apr 17 | No class (Spring Break) |  |
| Apr 19 | Satellite image interpretation I |  |
| Apr 20 | In-class Lab 4: cloud image classification |  |
| Apr 24 | Satellite image interpretation II |  |
| Apr 26 | Class project update presentation | (Undergrad) 10 pts;  (grad) 15 pts |
| May 1 | Satellite retrievals of temperature and moisture |  |
| May 3 | Satellite retrievals of clouds and aerosols |  |
| May 8 | Satellite retrievals of precipitation |  |
| May 10 | Preparation for presentation |  |
| May 15 | Student presentation I | (Undergrad) 30 pts;  (grad) 35 pts |
| May 17 | Student presentation II |